

## **REMARKS**

Claims 1-21 are pending.

### Summary of Telephonic Interview

The undersigned wishes to thank Examiner Zhe for taking the time to conduct a telephonic interview on Friday, April 11, 2008. The parties discussed proposed amendments to claims 1, 4 and 19 to address the Section 102 rejections based on Tudor. The Examiner responded favorably to the proposed amendments and indicated that more language in claims 1 and 4 to better clarify the virtual clock is advisable to address any potential future 103 rejections. The applicants amend claims 1 and 4 in light of these suggestions. Additionally, the Examiner requested more information as to the operation of the applicant's invention. An additional follow up telephone call was suggested in order to allow the applicant's attorney to gather this information and discuss further with the Examiner.

### Claim Amendments

While the Applicants disagree with the basis for certain rejections made in the Official Action, claims 1-4, 6, 8, 12, 16 and 19 are nonetheless amended to expedite prosecution. Claim 22 is added and claims 5 and 20 are cancelled. No new matter has been added due to these amendments and support for these amendments can be found throughout the Applicant's specification and figures.

### Claim Rejections under 35 U.S.C. §101

The Office has rejected claims 16-18 under 35 U.S.C. § 101 "because it recites a "system"; however, it appears that the system would reasonably be interpreted by one of ordinary skill in the art as software, per se, failing to be tangible embodied or include any recited hardware as part of the system. The applicants have amended claim 16 to be more clearly directed to a hardware means and thus, statutory subject matter. However, the applicants point out that any computer system has hardware and software components that may perform, either together or separately, the claimed invention (and any elements of the claimed invention). Accordingly, the applicants amend claim 16 to address the concerns of

the Office without limiting the invention to being implemented by hardware, software and/or hardware and software.

Accordingly, amended claim 16 and dependent claims 17-18 are clearly patentable under 35 U.S.C. § 101 and favorable reconsideration and withdrawal of these rejections are respectfully requested.

Claim Rejections under 35 U.S.C. §112

The Office has rejected claims 1-21 under 35 U.S.C. §112, second paragraph, as allegedly “being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.”

Regarding claim 12, the Office asserts that the terms “the set containing thread segments...” and “the singleton set” lack antecedent basis. Accordingly, the applicant amends claim 12 to provide proper antecedent basis for these terms.

Regarding claims 1 and 4, the Office asserts that it is “uncertain what the relationship is between “each shared memory location” of lines 4, 7 and “the location” of line 5.” The applicant amends claim 4 to clearly define this relationship. Additionally, the Office asserts that the relationships and functions of terms in lines 2-7 and 9-12 are uncertain. The applicant disagrees and reminds the Office that the claims must be interpreted in light of the specification. Accordingly, the applicant directs the attention of the Office to paragraphs [0025] to [0032] of the applicant’s specification which clearly discusses these relationships and functions of the elements.

Regarding claims 5 and 15, the Office asserts that “it is not clearly understood as to what “a virtual clock” does.” The applicant disagrees and directs the attention of the Office to paragraphs [0037] to [0039] of the applicant’s specification which clearly discusses virtual clocks in light of the applicant’s invention.

Regarding claim 12, the Office asserts that “it is uncertain as to what is meant by “a first thread joins a forked thread”.” The applicant disagrees and directs the attention of the Office to Figures 5-9 and paragraphs [0035] to [0042] of the applicant’s specification which clearly discusses forked threads in light of the applicant’s invention.

Regarding claim 13, the Office asserts that “it is not clearly understood as to how “the set containing the thread segment” can possible comprise a set containing the ordered pairs.”

The applicant disagrees and directs the attention of the Office to paragraphs [0009] and [0010] of the applicant's specification which clearly discusses ordered pairs in light of the applicant's invention.

Regarding claim 16, the Office asserts that "it is uncertain how "a compiler" is related to compiled code." The applicant disagrees and directs the attention of the Office to paragraphs [0045] to [0046] of the applicant's specification which clearly discusses the compiler in light of the applicant's invention.

Regarding claims 16 and 19, the Office asserts that "it is uncertain what "shared memory objects instrumentation information" is. The applicant disagrees and directs the attention of the Office to paragraphs [0012], [0045] and [0046] of the applicant's specification which clearly discusses instrumentation information in light of the applicant's invention.

Accordingly, in light of the above discussion, claims 1-21 are clearly patentable under 35 U.S.C. § 112 and favorable reconsideration and withdrawal of these rejections are respectfully requested.

#### Claim Rejections under 35 U.S.C. §102

Claims 1, 4, 16-17 and 19-21 stand rejected under 35 U.S.C. 102(e) as allegedly being unpatentable by U.S. Patent Number 6,920,634 to Curt D. Tudor (hereinafter "Tudor"). The Applicant respectfully disagrees.

Regarding claims 1 and 4, the applicant amends these claims to include the element of claim 5 of "maintaining a virtual clock associated with each thread" and asserts that Tudor does not teach, suggest or even mention the use of a clock, let alone a virtual clock for each thread. In rejecting claim 5 under Section 103, the Office directs the applicant's attention to column 6, lines 43-46 of Tudor and asserts that, based upon this passage, 1) Tudor teaches using a clock to time the amount of waiting time of a thread, and 2) it would have been obvious to modify Tudor to use a virtual clock with each thread. However, Tudor simply teaches waiting a predetermined amount of time to determine how many threads accessed a resource. This is clear from the cited passage which recites,

Upon awakening the first thread can collect the awakening messages, *possibly waiting a predetermined amount of time*,

to determine how many threads performed unsynchronized accesses to the resource.

This is completely different from the applicant's invention. And in fact, nowhere does Tudor teach, suggest or even mention associating a clock with each thread, let alone using a virtual clock and the Office does not provide any such teaching.

Additionally, the Office asserts that Tudor discloses "a mechanism for maintaining a set of thread segments that are ordered before a current thread segment of a thread" and directs the applicant's attention to Figure 6; column 2, lines 61-65; column 5, lines 63-67 and column 6, lines 22-33 of Tudor as support. The applicant disagrees and asserts that what Tudor does disclose at the cited locations is simply awakening a thread (that has been suspended) when a subsequent thread accesses a resource. This is not the same or even similar to maintaining a set of thread segments ordered before the current thread as claimed in the applicant's invention.

Regarding the rejections of claims 16 and 19, the applicant amends these claims to include the elements of claims 17 and 20 of modifying the compiler of the runtime system to insert calls to the race detector and asserts that Tudor teaches away from modifying the compiler to insert calls. In rejecting claims 17 and 20, the Office directs the applicant's attention to column 4, lines 61-67 and column 5, lines 1-22 of Tudor as support. And while Tudor does disclose object code insertion (OCI), Tudor does not even suggest modifying the compiler to insert calls. Additionally, Tudor incorporates by reference U.S. Patent No. 5,193,180 to Hastings and teaches using the techniques in Hastings to perform OCI. However, Hastings, and by extension Tudor, clearly teaches away from modifying the compiler as disclosed in column 2, lines 4-18 which recites,

The approach of having the compiler output the extra instructions required to implement a monitoring or analysis scheme is, however, *flawed in at least three significant ways*: First, *modifying the compiler to output new sequences is difficult*, and in practice, *nearly impossible*, because most programmers don't have the source code to the compiler. Second, recompiling all of a program's files just to get the extra instructions inserted can be *very time consuming and wasteful*. Finally, not all code goes through a compiler; some is written in assembly language and does not get the new instructions inserted into it.

In light of the above, Tudor clearly does not disclose and actually teaches away from the element of modifying the compiler to insert calls.

For the foregoing reasons, the applicant respectfully submits that amended claims 1, 4, 16 and 19 are not anticipated by Tudor. Inasmuch as claims 2, 3, 6-15, 17-18 and 21 depend, either directly or indirectly from amended claims 1, 4, 16 and 19, they too are not anticipated by Tudor for the same reasons. Nevertheless, the applicants wish to point out the following additional reasons why certain dependent claims are not anticipated by Tudor.

Regarding claim 21, the Office asserts that Tudor “teaches wherein adding the instrumentation information required by the race detector is by way of changing the memory allocator of the runtime system” and directs the applicant’s attention to column 5, lines 12-22 and column 6, lines 52-61 of Tudor as support. The applicant disagrees and asserts that at the referenced passages, Tudor merely discloses ‘wrapping’ a function to allow program flow to be intercepted (column 5, lines 12-22) and accessing a list of memory locations to see if a particular memory location is in the list (column 6, lines 52-61). This is clearly not the same or even similar to changing the memory allocator of the runtime system as claimed by the applicant. Accordingly, Tudor does not anticipate claim 21.

#### Claim Rejections under 35 U.S.C. §103

Claims 2-3, 5-15 and 18 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Tudor.

In light of the discussion hereinabove with regards to the Section 102 rejections of amended independent claims 1, 4, 16 and 19, the applicants assert that claims 1, 4, 16 and 19 are clearly patentably non-obvious over Tudor. And because claims 2-3, 5-15 and 18 depend, either directly or indirectly, from amended independent claims 1, 4, 16 and 19, claims 2-3, 5-15 and 18 must also be clearly patentably non-obvious over Tudor for the same reasons. Nevertheless, the applicants wish to point out the following additional reasons why certain dependent claims are clearly non-obvious over Tudor.

Regarding the rejections of claims 2-3, 5-11 and 15, the applicants point out that claim 5 is cancelled and claims 2-3, 6-11 and 15 rely on the elements of a “mechanism for maintaining the set of thread segments” and/or “a virtual clock associated with each thread,” which as discussed hereinbefore, is not disclosed or taught by Tudor. Additionally, regarding

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claims 9 and 12, it is clear that Tudor does not disclose, teach or even mention a singleton set, let alone using a singleton set computing a set of thread segments as the union of a singleton set and another element. And the Office provides no such teaching. The analogy provided by the Office for support of its conclusion that Tudor teaches this element merely teaches that a grandparent comes before the parent who comes before the child. The applicants do not understand how the Office has connected this analogy with the union of a singleton set and the set of thread segments that are ordered to compute the set of thread segments. The applicants respectfully request clarification of this reasoning or withdrawal of this rejection. Accordingly, claims 2-3, 6-11 and 15 are clearly non-obvious over Tudor.

For the foregoing reasons, the applicant respectfully submits that amended claims 2-3, 6-15 and 18 are clearly patentably non-obvious over Tudor and are thus allowable.

### **CONCLUSION**

For all the foregoing reasons, the Applicants respectfully submit that the present application is now in condition for allowance

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